

What is claimed:

1 1. A method for manufacturing a semiconductor device comprising:
2 forming a first electrode above a semiconductor substrate;
3 forming a dielectric material on the first electrode;
4 forming a second electrode on the dielectric material;
5 wherein the forming the first electrode and the forming the second electrode are
6 controlled so that at least one of the first electrode and the second electrode are formed from
7 a material comprising titanium nitride containing oxygen atoms, wherein the titanium nitride
8 containing oxygen atoms includes an amount of oxygen atoms within a range of from 5 to
9 25 atomic %.

1 2. A method as in claim 1, comprising forming the first electrode from the
2 material comprising titanium nitride containing oxygen atoms, wherein the titanium nitride
3 containing oxygen atoms includes an amount of oxygen atoms within a range of from 5 to
4 25 atomic %.

1 3. A method as in claim 1, comprising forming the second electrode from the
2 material comprising titanium nitride containing oxygen atoms, wherein the titanium nitride
3 containing oxygen atoms includes an amount of oxygen atoms within a range of from 5 to
4 25 atomic %.

1 4. A method for manufacturing a semiconductor device comprising:
2 forming an insulating layer above a semiconductor substrate;
3 forming a conducting region above the insulating layer, the conducting region
4 selected from the group consisting of a gate electrode and an undercoat wiring;
5 forming a dielectric layer above the conducting region;
6 forming a film selected from a titanium nitride layer containing oxygen atoms within
7 a range of from 5 to 25 atomic %;
8 forming an electrode for a capacitive element above the dielectric layer by

9 processing the film; and
10 forming an out-going electrode connected to the electrode for the capacitive element.

1 5. A method as in claim 4, further comprising wherein the out-going electrode
2 extends above the electrode for the capacitive element.

1 6. A method for manufacturing a semiconductor device comprising:
2 forming a diffusion layer in a semiconductor substrate;
3 forming an insulating layer over the diffusion layer;
4 forming a first through-hole in the insulating layer located above the diffusion layer;
5 forming a film above the insulating layer and in the through-hole, the film
6 comprising a material selected from the group consisting of a TiN, titanium nitride
7 containing oxygen atoms, and MoSi_x;
8 forming an electrode for a capacitive element connected to the diffusion layer
9 through the first through-hole by processing the film;
10 forming a dielectric layer above the electrode for the capacitive element;
11 forming a second electrode for the capacitive element above the dielectric layer;
12 forming a second through-hole passing through the insulating layer above the
13 diffusion layer; and
14 forming an out-going electrode connected to the diffusion layer through the second
15 through-hole.

1 7. A method of manufacturing a semiconductor device according to claim 6,
2 wherein the layer of material comprises titanium nitride containing oxygen atoms and the
3 titanium nitride containing oxygen atoms is formed by depositing a TiN layer by sputtering
4 and injecting oxygen ions into the sputtered TiN layer.

1 8. A method of manufacturing a semiconductor device according to claim 7,
2 wherein the titanium nitride containing oxygen atoms includes an amount of oxygen atoms
3 within a range of from 5 to 25 atomic %.

1 9. A method of manufacturing a semiconductor device according to claim 6,
2 wherein the layer of material comprises titanium nitride containing oxygen atoms and the
3 titanium nitride containing oxygen atoms is formed by depositing a TiN layer by sputtering
4 and oxidizing the sputtered TiN layer.

1 10. A method of manufacturing a semiconductor device according to claim 9,
2 wherein the titanium nitride containing oxygen atoms includes an amount of oxygen atoms
3 within a range of from 5 to 25 atomic %.

1 11. A method of manufacturing a semiconductor device according to claim 6,
2 wherein the layer of material comprises titanium nitride containing oxygen atoms and the
3 titanium nitride layer containing oxygen atoms is formed by sputtering with Ti as a target in
4 an atmosphere comprising oxygen gas and nitrogen gas.

1 12. A method of manufacturing a semiconductor device according to claim 11,
2 wherein the titanium nitride containing oxygen atoms includes an amount of oxygen atoms
3 within a range of from 5 to 25 atomic %.

1 13. A method of manufacturing a semiconductor device according to claim 6,
2 wherein the layer of material comprises titanium nitride containing oxygen atoms and the
3 titanium nitride layer containing oxygen is formed by forming a Ti layer by sputtering and
4 annealing the Ti layer in an atmosphere comprising oxygen gas and nitrogen gas.

1 14. A method of manufacturing a semiconductor device according to claim 13,
2 wherein the titanium nitride containing oxygen atoms includes an amount of oxygen atoms
3 within a range of from 5 to 25 atomic %.

1 15. A method of manufacturing a semiconductor device according to claim 15,
2 wherein the layer of material comprises MoSi_x and the MoSi_x layer is formed by sputtering
3 an MoSi_x target.

1 16. A method of manufacturing a semiconductor device as in claim 15, wherein
2 the MoSi_x target has the same composition as the MoSi_x film.

1 17. A method of manufacturing a semiconductor device according to claim 4,
2 further comprising forming at least one of a resistance element and a fuse element, wherein
3 the electrode for the capacitive element comprises has the same composition as that of that
4 at least one of a resistance element and a fuse element.

1 18. A method of manufacturing a semiconductor device according to claim 31,
2 further comprising forming the electrode is formed simultaneously with any one of a
3 resistance element and a fuse element.

1 19. A semiconductor device comprising:
2 forming a first diffusion layer region in a semiconductor substrate;
3 forming an first insulating layer region disposed over the first diffusion layer region;
4 forming a first through-hole in the first insulating layer region;
5 forming a lower electrode for a capacitive element connected to the first diffusion
6 layer region through the first through-hole, the lower electrode including an upper surface
7 comprising a material selected from the group consisting of TiN, titanium nitride containing
8 oxygen atoms, and MoSi_x ;
9 forming a dielectric layer disposed in direct contact with the upper surface of the first
10 electrode;
11 forming an upper electrode for the capacitive element above the dielectric layer;
12 forming a first out-going electrode connected to the first diffusion layer region.
13 forming a second diffusion layer region in the semiconductor substrate;

14 forming a second insulating layer region disposed over the second diffusion layer
15 region;
16 forming a second through-hole passing through the second insulating layer region
17 directly above the second diffusion layer region, the second through-hole being spaced a
18 distance away from the first through-hole;
19 forming an element on the second insulating layer region that is spaced apart from
20 the lower electrode and formed from an identical material as the lower electrode, the
21 element being connected to the second diffusion layer region through the second through
22 hole;
23 forming a second out-going electrode connected to the second diffusion layer region.
24 forming a third diffusion layer region spaced from the first and second diffusion
25 layer regions, wherein the second diffusion layer region is located between the first and
26 second diffusion layer regions;
27 forming a third insulating layer region disposed over the third diffusion layer region;
28 wherein the element is also formed on the third insulating layer region; and
29 forming a third through-hole extending through the third insulating layer region directly
30 above the third diffusion layer region, the element being connected to the third diffusion
31 layer region through the third through-hole; and
32 a third out-going electrode connected to the third diffusion layer region.

1 20. A semiconductor device as in claim 19, comprising forming the lower
2 electrode upper surface from a material selected from the group consisting of (1) MoSi_x
3 where X is in the range of 1.7 to 3.3, and (2) titanium nitride containing oxygen atoms
4 where the oxygen atoms are in the range of 5 to 25 atomic %.